

Army Engineers and Western Expansion

The story of the Galveston army engineers fits into the larger saga of the American Southwest. In exploring and developing this vast, arid region, man encountered many hardships, not the least of which was the absence of water. Availability of this precious element was crucial to the success of any undertaking. Galveston offered the natural resources to provide a desperately needed Gulf Coast outlet; the Corps of Engineers possessed the technical expertise and experience. Such were the circumstances that eventually led the army engineers to Galveston Island.

The engineers' story really begins in 1802 with establishment of the Corps of Engineers and the military academy at West Point. Initially, this arm of the United States Army responded to the country's pressing need for trained engineers and for an adequate network of coastal defense. During the ten years prior to the War of 1812, army engineers directed their attention almost exclusively to the military school and to fortifications along the more densely populated eastern seaboard.

In the course of their work on harbor defenses, the early engineers surveyed estuaries and rivers, gaining data that proved useful to seamen and port officials. The value of applying such information to civil improvement and national development soon became obvious, leading to creation of a Topographical Bureau in the Engineer Department by 1818. Eleven years later, Col. John J. Abert assumed leadership of this bureau. In 1838, Congress established the enlarged Corps of Topographical Engineers, directed by Abert throughout all but the last two of its twenty-five-year existence; his counterpart in the Corps of Engineers during these years was Chief Engineer Maj. Gen. Joseph G. Totten.¹

The appropriate function for the army engineers provided a subject for considerable debate. Opinions varied as to the proper nature and extent of federal government involvement in internal improvements. The General Survey Act, passed in 1824, formalized the introduction of army engineers into civil engineering and set up a format for using their scientific skills in making surveys, plans, and estimates for roads and canals which merited national support. With the government surveys for the Baltimore & Ohio Railroad in 1827, canals began to relinquish their priority to the railroads. Construction of lighthouses gradually gained importance along with western roads and other projects such as beacon lights, monuments, bridges, and aqueducts. Surveying for river and harbor improvements

expanded steadily. Finally, the profusion of surveys for roads, canals, and railroads gave way to military and geographical surveys of coastal, geological, and mineralogical features. Military field work increased rapidly and efforts were directed toward examination of the natural frontiers and surveys to determine political boundaries.

With repeal of the General Survey Act in 1838, civil constructions of the Topographical Bureau were augmented by the transfer of all such works previously directed by the Corps of Engineers. Having acquired its status of a full-fledged corps, the new Corps of Topographical Engineers entered into activities that would constitute one of the most colorful chapters in the history of the American West.

The Texas Frontier

From 1824 to 1838, while the topographical engineers were emerging as the nation's surveyors and explorers, Texas was undergoing dramatic changes. Settlement had become the new order of the day. Mexico (which included Texas) had won its independence from Spain in 1821. Up to that time, Texas had but three permanent settlements and a population estimated at no more than 7,000. With land granted by Mexico, Stephen F. Austin began colonizing Texas. As the Anglo population increased, Mexico began to toughen its policies on the new settlers. The result was the War of Independence and creation of the Texas Republic in 1836. The call to arms had reached out to distant points and attracted an influx of heroic men, many of whom remained to augment the Texas population which numbered between 35,000 and 50,000 at the outbreak of the war. During the years of the republic, the population continued to climb; when the United States annexed Texas in 1845, the estimated population was between 125,000 and 150,000.

If the interest of the army engineers in Texas had been formerly casual, annexation quickly corrected this oversight. The eyes of the nation turned on Texas, which suddenly found itself in the federal limelight. Both military and civil needs demanded the attention and expertise of the well-schooled officers of the Topographical Corps.²

The most pressing concern was the military situation. Defenses were needed against the chronic threat of the Indians and, of perhaps greater urgency at that moment, against the Mexicans who were refusing to acknowledge Texan independence. Attempts at diplomacy with Mexico proving futile, President James K. Polk decided to resort to arms to maintain the Texas border at the Rio Grande.

Despite its sudden involvement in Texas, "the American general staff was singularly ignorant of Southwestern geography."³ The task of cor-

recting this deficiency was a natural one for the topographical engineers. Although promoted by the diplomatic crisis with Mexico, several expeditions launched in 1845 concentrated on gathering scientific information about the unknown country. This intelligence proved useful to military strategists and settlers alike. As annexation became imminent and diplomatic relations with Mexico further deteriorated, Colonel Abert sought greater knowledge of the Texas geography.

Command of the first Texas expedition fell to the colonel's own son, fledgling Lt. James W. Abert. His assignment was a reconnaissance of the territory of the Comanche and Kiowa Indians, crossing the Llano Estacado (Staked Plains) in northwest Texas, and traveling east along the Canadian River.⁴ The party set out from Colorado in mid-August, equipped with only a sextant and chronometer. Much of Abert's march through the Comanche Territory was accompanied by the sound of war drums, undoubtedly causing the explorers considerable consternation, but they were never attacked and arrived safely in the Arkansas Territory late in October. Along the way, the officers collected flora and fauna, gathered geological data, and noted the mineral resources of the region.

The young Lieutenant Abert succeeded in his scientific quest by providing the first trustworthy representation of the Canadian River region of North Texas. He scored another first in providing the federal government valuable descriptions of the Indians. Although the information he furnished contained many implications for settlement, it was more immediately utilized for military purposes.

When the War with Mexico broke out in May of 1846, the topographical engineers plunged into combat duty, which they combined with their instinctual acquisition of scientific information. Although their mapping activities were largely confined to Mexican soil, they experienced first-hand the practical problems to be reckoned with in the unfamiliar environment of the Southwest; further, they developed an appreciation for the vital importance of water to any future enterprise that might be planned for the area.

The Treaty of Guadalupe Hidalgo, signed February 2, 1848, brought to an end the Mexican War and transferred to the United States ownership of a huge expanse of western land, but failed to delineate the exact line of the border between the two countries. The vague boundary specified in the treaty encompassed many points of strategic importance.

This ambiguity led to a survey of the boundary between the United States and Mexico, the first large-scale project undertaken by the topographical engineers in the Southwest. The bitter conflict that arose over this boundary was finally resolved by the Gadsden Treaty of December 30, 1853, through which the United States purchased land that could be

used for a southern railroad route along the thirty-second parallel. Maj. William Hemsley Emory, as commissioner and chief astronomer, surveyed the Gadsden Boundary from December, 1854 through October, 1855. By January, 1857, official maps had been drawn, reports submitted to Congress, and the field records of the Mexican Boundary Survey were closed. The expedition yielded valuable geological information, the largest botanical survey to date, extensive zoological classification, and knowledge of the Indian tribes of the Southwest.

Article XI of the Treaty of Guadalupe Hidalgo had explicitly assigned the United States Army responsibility to defend the frontier against the Indians. Maintenance of this military frontier, which extended west from San Antonio to Fort Yuma, required construction of forts and connecting roads, surveys of rivers and harbors as avenues of supply, and mapping of Indian trails. A significant part of the army was stationed between these two points and topographical engineers were assigned to military commands for which they provided necessary reconnoitering services.

By 1849, the country had begun to grasp the strategic value of Texas, the enormous potential of its vast, untapped resources, and the obvious commercial and settlement opportunities. Defense against the Indians, a prerequisite to any form of development, rose on the roster of federal priorities. Meanwhile, individuals and factions from widely divergent vantage points were clamoring for transportation routes between the Mississippi and the Pacific.

Early in 1849, Texas Senator Sam Houston called for a transcontinental survey. Subsequently, the Senate Committee on Military Affairs, headed by Jefferson Davis, recommended an appropriation of \$50,000 for surveys in Nebraska, California, New Mexico, and Texas, with an eye toward roads that would bind the country together.

Abert detailed Brevet Lt. Col. Joseph E. Johnston to make river surveys and explore routes for wagon roads in Texas. Many expeditions of topographical engineers fanned out across Texas in 1849 and great strides were made in closing the gaps in geographical knowledge of the region. Numerous routes were explored and laid out, some of which became major avenues of transportation. Although the country was on the threshold of the railroad era, the engineer officers never lost sight of the value of navigation. They sought routes that would connect with navigable waterways and repeatedly urged steps aimed toward facilitating river travel, which was less expensive than travel by freight wagon or pack mule.

In these reconnaissances conducted during 1849 and the several succeeding years, topographical engineers pushed back the western frontier and opened up the Southwest for settlement by clearing away the Indian

barrier and laying out lines of communications. Their major contribution, badly needed maps of the area, was put to immediate practical use by soldier, settler, and gold seeker. Expedience and sectional rivalry, however, took precedence over any carefully conceived master plan for continental expansion; Colonel Abert's vision of a federal communication network became "splintered into the fragmented surveys in West Texas and those through the Navaho country and among the gold fields of California."⁵

In several respects, the year 1853 marked a major turning point for the Topographical Corps. The survey of the Mexican-U.S. Boundary was winding up; settlement, less dependent upon the services of the engineers, was proceeding in orderly fashion; and the railroad issue had become the order of the day. Naturally, each section of the country wanted the railroad to run through its territory.

Rivalries among the various sections culminated in the Pacific Railroad Survey Bill passed by Congress on March 2, 1853. Under a skimpy appropriation of \$150,000, the bill charged Secretary of War Jefferson Davis to submit, by the first Monday of February, 1854, a full report on all practicable railroad routes to the Pacific based upon field surveys performed by parties under the supervision of topographical engineers.⁶

Capt. (later Maj. Gen.) George B. McClellan's expedition through the Northwest suggested that this route would entail great expense and tended to disqualify it as a prime contender. Lt. John W. Gunnison, who was massacred along with others in his party, demonstrated the infeasibility of Missouri Senator Thomas Hart Benton's "great central path" along the thirty-eighth parallel, again because of the expense involved in tunneling, bridging, and spanning gullies. Lt. Amiel W. Whipple, exploring the thirty-fifth parallel, retraced the junior Abert's route along the Canadian River and proceeded via Albuquerque to California. He was enthusiastic about this route and modified the earlier belief that the entire Southwest comprised a hostile, infertile environment.

When the topographical engineers began comparing relative merits of the alternate routes, they confronted a deficiency of adequate data on the thirty-second parallel route. As a result, two more expeditions were launched in the fall and winter of 1853-54. Lt. John C. Parke was sent to resurvey the Gila River route as far east as the Rio Grande; Capt. John Pope was assigned the eastern portion of the route between the Rio Grande and Preston on the Red River. Both expeditions encountered few obstacles, but noted the lack of water and advised drilling for artesian wells. Pope undoubtedly lived to regret this recommendation, spending the next 3½ years engaged in a futile search for water on the Llano Estacado.

The Pacific Railroad Survey by no means settled the railroad issue. Instead of designating one superior route for a transcontinental railroad, the surveys suggested that several practicable routes existed and, in essence, killed the possibility of any federally sponsored transcontinental railroad during the period prior to the Civil War. Failing to accomplish their primary purpose, they nevertheless produced an impressive compendium of knowledge. The massive reports of the railroad surveys were published between 1855 and 1860. Lt. Gouverneur K. Warren's map of the land west of the Mississippi represented a landmark in American cartography and provided the most comprehensive view of the West to that time.

The valuable information gained from the surveys and geographical explorations conducted by the topographical engineers contributed greatly to expansion of the western United States; it was a boon to development of transportation, settlement of communities, utilization of resources, and economic growth. The vigorous quest of the engineers for knowledge was manifested in their vast collection of meteorological data on the country through which railroads might pass, geological studies on the nature of the soil, awareness of natural resources such as coal and water sources, and in their attention to zoological and botanical factors as they might pertain to development of the territory. Their application of engineering expertise to promote economic development was as vital to westward expansion as it had been years earlier to the growth of internal improvements.⁷

Although the prestige of the Topographical Corps began to decline during the 1850s, the demand for services of its engineers climbed steadily. Roads were urgently needed and, while Congress debated whether jurisdiction for these public works should continue under the War Department or be transferred to the Department of the Interior, topographical engineers were out in the territories working on them. Major river and harbor appropriations in 1852 caused the return of many works to the Corps of Engineers; for the next decade, the two engineer corps shared these works.⁸

Two of the last expeditions in Texas led by the topographical engineers were conducted in the summers of 1859 and 1860 by Lt. William H. Echols. Similar to the surveys undertaken by Col. Joseph Johnston and his officers in 1849-50, these expeditions attempted to locate appropriate supply routes for isolated army outposts. One striking difference distinguished these expeditions from those ten years earlier.

As early as 1853, Secretary of War Davis had expressed his dissatisfaction with the use of horses, mules, and oxen to draw wagons carrying supplies for military outposts, particularly those in arid regions where

water and vegetation were at a premium. Allowing that a railroad would alleviate the problem somewhat, he indicated there were still remote regions in the interior that would not benefit from the railroad and he suggested a novel plan for trial:

For . . . military purposes, for expresses, and for reconnoissances [sic], . . . the dromedary would supply a want now seriously felt in our service; and for transportation with troops rapidly moving across the country, the camel . . . would remove an obstacle which now serves greatly to diminish the value and efficiency of our troops on the western frontier.

For these considerations it is respectfully submitted that the necessary provision be made for the introduction of a sufficient number of both varieties of this animal, to test its value and adaptation to our country and our service.⁹

Lieutenant Echols drew this assignment and his two expeditions tested the usefulness of Arabian camels as beasts of burden in supplying the frontier garrisons. The 1859 expedition set out from Camp Hudson on the Devil's River near the edge of the Edwards Plateau country.

Strung out over the dazzling landscape were twenty-four camels, burdened with packs and water casks weighing up to 500 pounds each. They were tended by special camel drivers, who were unfortunately so inept at loading the beasts that the packs and water casks kept crashing to the ground.¹⁰

In their journey across the Pecos to Fort Davis and on to Camp Stockton and in a reconnaissance of the Big Bend country, the camels bore their burdens successfully; in contrast, the horses and mules with their incessant needs for water were a constant hindrance.

The 1860 expedition was a different story. Crossing the wastelands west of the Pecos, the party was subjected to an inhospitable stretch of 120 miles and four days without water.

The mules cried piteously and gnawed the canteens, the soldiers slept on their individual water supply, vigilant lest a comrade steal it, and finally the camels began to bellow in hideous fashion, which suggested that even they had reached the limit of endurance.¹¹

Fortunately, Echols located water in time to preserve the integrity of his command. He moved on, succeeded in selecting a fort site on the Rio Grande, and improved existing Indian trails into suitable military roads as the party proceeded. But the camel experiment ended on a dismal note and the gangling beasts were sold at public auction by the Quartermaster Corps.¹²

By 1860, the prestige of the Topographical Corps had reached a low ebb, private capital had made its entrance into the road building scene, and the era of the topographical engineers was on its way out. The outbreak of Civil War hostilities in 1861 hastened organizational disintegration of the Topographical Corps. Abert retired in that year; he was replaced by Col. Stephen H. Long in the couple of years that remained. Returned to the subordinate status it had held in 1831, the Topographical Corps was "legislated into oblivion" on March 3, 1863, through a merger with the Corps of Engineers under General Totten.¹³

The Gulf Coast Engineers

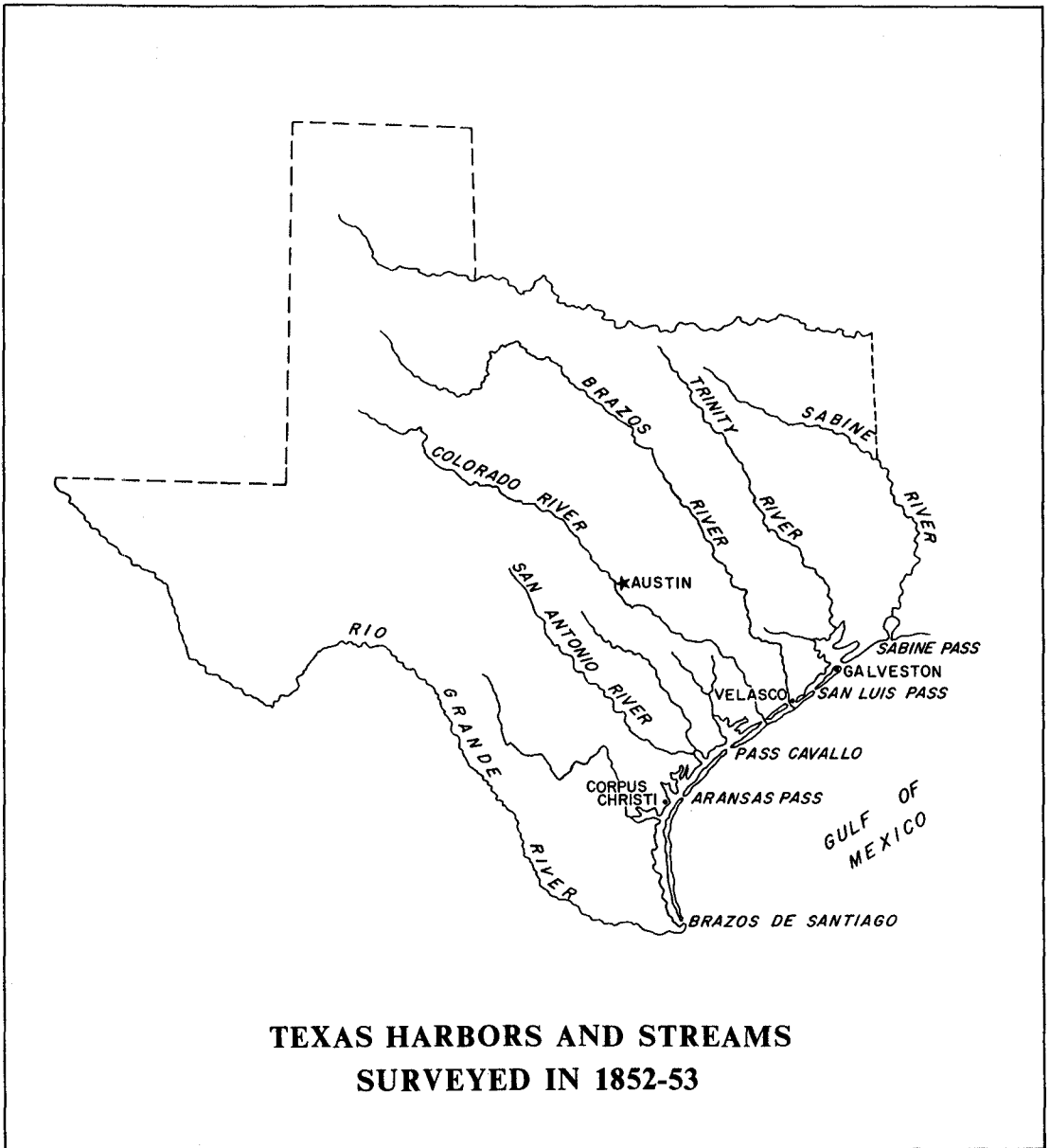
During the years when the topographical engineers were exploring the Texas interior, the Corps of Engineers was discharging both military and civil duties on the Gulf Coast. From Pensacola, the superintending engineer for the Gulf of Mexico Frontier directed engineer activities on the coast between 1828 and 1856. On and off, engineer officers were assigned temporary duty in New Orleans. In September, 1840, Lt. (later Capt.) Henry L. Smith was sent to serve with Capt. John C. Barnard; they were joined within a year by Lt. Pierre G. T. Beauregard. Following the disruption of the War with Mexico, Beauregard emerged in 1852 with assorted responsibilities formerly under Barnard's command and orders from Washington to carry out an ambitious program of civil works. During the short-lived (1852-53) revival of federally funded internal improvements, army engineers conducted examinations for various river and harbor works in Mississippi, Louisiana, and soon thereafter, in Texas.¹⁴

The Rivers and Harbors Act of August 30, 1852 sparked extensive, but quickly extinguished, federal interest in the Texas Gulf Coast that was not rekindled until late in the 1860s. Congress appropriated \$1,500 for survey of the San Antonio River and \$5,000 for surveys of harbors at Sabine, Galveston, Pass Cavallo, Velasco, Brazos de Santiago, and Corpus Christi, and for the Rivers Sabine, Brazos, and Trinity.¹⁵

Lt. George B. McClellan, chief engineer of the Department of Texas, surveyed the bars from Pass Cavallo to the mouth of the Rio Grande early in 1853. Following this assignment, he led the Pacific Railroad Survey



Maj. Gen. George B. McClellan (Library of Congress)



expedition of the northwestern route through the Cascade Mountains. McClellan would achieve still greater distinction in the years ahead as a Union soldier in the Civil War and, in 1864, as an unsuccessful contender against Abraham Lincoln for the national presidency.¹⁶

Lt. William H. C. Whiting examined the bar at Velasco at the mouth of the Brazos and conducted reconnaissances of the Colorado and Trinity rivers. Lt. Walter H. Stevens examined the San Antonio River and the bar at the entrance to Galveston Harbor. Lt. Henry L. Smith surveyed the Sabine River.¹⁷

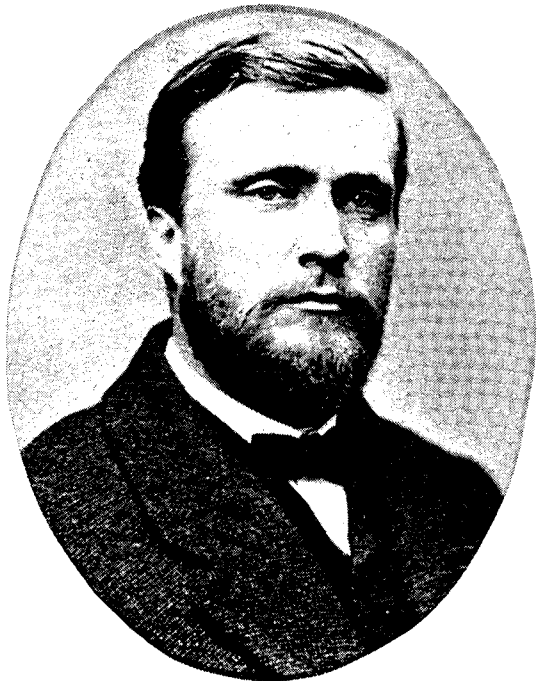
Lieutenant Smith, who had been assigned river and harbor responsibilities in Mississippi, Louisiana, and Texas, succumbed to yellow fever

in September, 1853. Responsibility for Texas was turned over to Beauregard, and later to his assistant, Lt. Walter H. Stevens. An Engineer Department order on April 9, 1857 created a Board of Engineers for the Gulf Coast, on which Beauregard enjoyed senior rank and Stevens represented New Orleans and Galveston. In general, this organizational structure was maintained until the eve of the Civil War, when engineer officers joined fighting units for either the Union or the Confederacy.¹⁸

The war gave rise to a Department of the Gulf which existed until 1865. From it, two distinct commands emerged. The military division, serving the needs of the army, was renamed the Department of the Gulf in August, 1866 and later became part of the Fifth Military District composed of Texas and Louisiana. The other command, concerned with immobile fortifications, evolved into the postwar New Orleans Engineer Office.¹⁹

In June, 1865, Maj. Miles D. McAlester was appointed chief engineer of the Department of the Gulf, shortly before its demise. By March, 1866, he was described as the officer "in charge of Engineer operations on the Gulf of Mexico." Within a year, the U.S. Engineer Office had returned to peacetime operations. Passage of a decade would find the New Orleans Engineer Office superintending an impressive array of river and harbor activities in Louisiana and Texas. Operations in Texas continued to be directed by the engineer in charge at New Orleans until the Galveston Engineer Office was established in 1880.²⁰

Maj. Miles D. McAlester
(Library of Congress)



Engineer activity on the Texas Gulf Coast resumed with passage of the Rivers and Harbors Act of March 2, 1867. In its very last paragraph, this act directed the secretary of war

. . . to cause plans and estimates to be made of the most practicable and effective mode of improving the harbor at Galveston, Texas, and of erecting suitable breakwater at that point.²¹

This unobtrusive paragraph marked the beginning of continuous federal commitment in the coastal region of Texas.

"The Best Harbor on the Texas Coast"

Conducting surveys in the early 1850s and, later, in the years after the Civil War, the army engineers encountered a striking resemblance among harbor entrances in Texas. At each pass, the southern headland projected further into the Gulf than did the northern headland (notably, Galveston, San Luis Pass at West Galveston Bay, Pass Cavallo at Matagorda Bay, and Aransas Pass). Littoral currents in these locations, acting in concert with the prevailing easterly winds, caused the lands south of each pass to gradually wear away.²²

Indeed, such erosion was dramatically evident at the eastern tip of Galveston Island (Fort Point) which had actually shifted westward as much as 1,200 yards over the years from 1841 to 1870. This relocation was accompanied by gradual deviation of the main channel and formation of a bar at the inner end of the channel. The bar was formed of "fine rounded sand peculiar to the islands . . . forming the Gulf coast" and possessing the "characteristics of quicksand." Easily moved by current and hazardous to navigation, this "quicksand" was described by Capt. (later Maj.) Charles W. Howell, the engineer who directed river and harbor improvements along the Texas Coast during the 1870s:

It affords the least desirable of all foundations upon which an engineer may be obliged to build.²³

In 1853, Lt. W. H. Stevens had presented to General Totten the first engineer proposal to deepen the inner bar, by prolonging the head of Galveston Island. Stevens observed that the 30-foot depth over the bar, noted in 1841, had diminished to 12 feet. His recommendation for removal of this bar was:

. . . to throw a breakwater from east end . . . [to] intercept the breakers from the southeast, and force the current which cuts across the end of the island into the channel

He advised that the estimate for this work should be based on at least six months of "careful observations . . . by a person of intelligence."²⁴

This proposal seemingly came to naught. Not until 1867 did the engineers again turn their attention to improving Galveston Harbor. In the interim, shoaling had been abetted by chain and pile obstructions placed across Galveston Channel as a blockade during the Civil War. Early in 1867, the U.S. Coast Survey found a scant 9½ feet of water over the inner bar at mean low tide. Noting this decreased depth, Chief of Engineers Brig. Gen. (later Maj. Gen.) Andrew A. Humphreys instructed Major McAlester to study the situation.²⁵

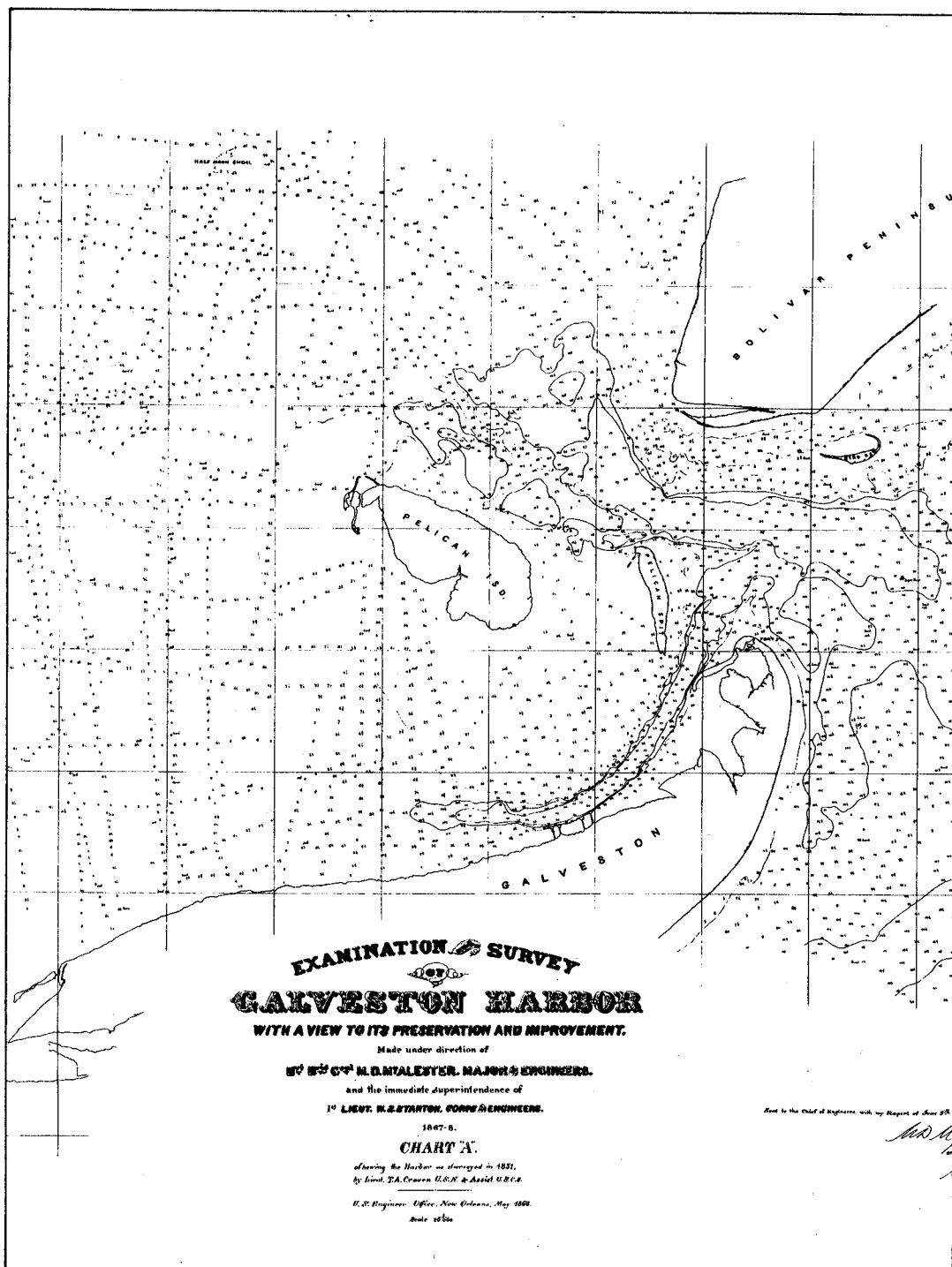
Lt. William S. Stanton directed the Coast Survey in conducting the examination and survey. He began field work on June 4, 1867, was interrupted until December by a record yellow fever epidemic, and completed the study early in April, 1868.²⁶

Stanton's report contained three possible approaches to the deepening of the inner bar. The first, a system of jetties from Pelican Island and Pelican Spit designed to deflect the tides of Bolivar Channel to the benefit of Galveston Channel, McAlester dismissed as inadequate and too costly. The second, a dam closing San Luis Pass to increase the area of Galveston Channel reservoir and cause a greater volume of water to flow through the channel, McAlester considered "legitimate and judicious," but again he found the estimate of \$330,000 decidedly too steep. The third alternative, dredging a channel 12 feet deep and 80 feet wide across the bar, McAlester recommended as "the most judicious and efficacious plan." It was also the least expensive.²⁷

Late in November, 1868, McAlester was transferred out of New Orleans. His death the following April prevented him from seeing his dredging recommendation accepted.²⁸ On July 11, 1870, Congress appropriated \$25,000 toward this objective.

Capt. C. W. Howell, who assumed the New Orleans command on June 7, 1869, inherited this project. Initially, he was assisted by Lt. H. M. Adams, who served mainly in Galveston, and Lt. E. A. Woodruff, who surveyed the coastal and inland waterways.

Howell was directed to carry out the dredging work on a contract basis. This proved infeasible. It was next proposed to hire floating plant, to purchase fuel, provisions, and other needed supplies, and to employ the labor required to prosecute the work direct from the New Orleans Office. Again thwarted, Howell indicated,



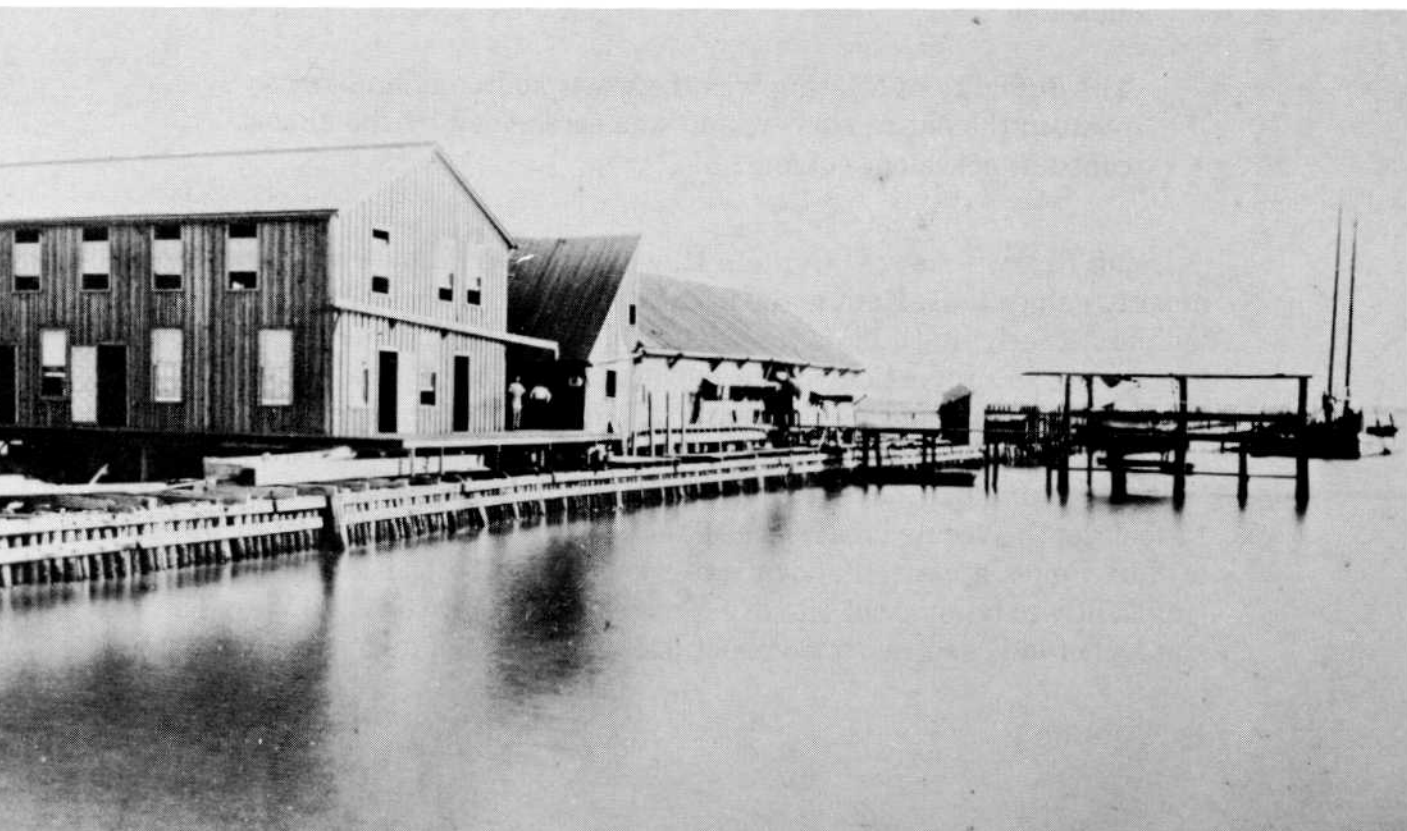
Map produced by Examination and Survey of Galveston Harbor, 1867-68
 (National Archives)

After much time spent in search of an available dredge, I was forced to abandon this project, all dredges on this coast being fully employed in more remunerative work.²⁹

In April, 1871, he received authority to purchase a dredge-boat, two dump-scows, and a tugboat.

By the time Howell acquired these vessels, he had no occasion to use them because scouring had increased the capacity of the channel across the inner bar to a depth as great as that across the outer bar. The boats were put to other use during the year and the appropriation for harbor improvement was applied to extending and strengthening the pile breakwater at Fort Point. Begun in 1869, this frail structure had been the first attempt to implement an improvement along the lines originally proposed by Lieutenant Stevens. Financed by the city of Galveston and spearheaded by Charles Fowler, a former seaman who had become manager of the Morgan interests at Galveston, the breakwater had been completed in 1870 as far as city funds permitted.³⁰ Although unequal to the long-term challenge of withstanding the force of the currents and waves that battered its pilings, this breakwater almost immediately checked erosion and stabilized Fort Point's position. By 1873, the rehabilitated breakwater had been extended beyond a mile in length and had succeeded in deepening the water along the front of it.

Pile breakwater and Engineer Department quarters and workshops at Fort Point, 1875



Howell viewed Galveston as the most central, "if not the best harbor on the Texas coast," considering it the harbor "most susceptible of permanent improvement, to meet the full requirements of commerce." Acknowledging the possible disputability of the claim that the harbor entrance had once been 30 feet deep, he declared with certainty that shoaling of the inner bar had continued to occur within recent years and he recommended:

. . . that only the harbor of Galveston be selected for improvement, and such dribblets of appropriation as might otherwise be wasted on other Texas harbors be consolidated, to inaugurate a permanent and valuable work at Galveston.³¹

Civil Assistant Engineer Henry Clay Ripley undertook surveys preliminary to a plan for permanent works of improvement. Ripley had to overcome many difficulties in discharging this assignment. Undaunted, he made the best of an unsatisfactory transit for the triangulations and uncooperative weather:

. . . the tug "Hall" . . . was used for outside soundings, and a small four-oared boat for inside and shallow soundings. I was able to utilize much of the windy weather by sounding outside when the wind blew off shore and inside when it blew from the Gulf. The only drawback to this admirable arrangement was the exceeding difficulty in preventing the "Hall" from getting aground.

The difficulty of locating was the great source of embarrassment in the entire survey, and was occasioned by the almost constant prevalence of fog³²

Using Ripley's survey, Captain Howell reviewed the formation of the inner bar since 1841. First noted in 1843, the bar had shoaled "irregularly but persistently" until 1867, when it afforded only 9 feet in depth, and had lengthened in proportion to the movement of Fort Point. Subsequent works of improvement had increased the depth over the inner bar to 12 feet by 1872.³³

The outer bar had moved slightly gulfward and essentially maintained a 12-foot depth over its crest since 1841. Pelican Spit, a shoal located west of Fort Point, appeared above water some time before 1851 and grew sufficiently to become the site of a fortification during the Civil War. The spit had eroded and reformed about 500 yards west of its initial position,

become considerably wider at its southern end, and was moving toward Pelican Island faster than Fort Point, thereby increasing the distance between them.³⁴

The "Cement Pot Jetty" Experiment

Howell clung tenaciously to his original notion of a "permanent" improvement for Galveston Harbor. His proposal, submitted to the chief of engineers in December, 1873, was calculated to remove the inner bar between Fort Point and Pelican Spit and to deepen the channel over the outer bar to a depth of 18 feet. This was to be accomplished by extending the city breakwater northeast to the verge of the Bolivar Channel, where it would cause sufficient scouring to remove the inner bar. The structure would then turn seaward and advance toward the outer bar, accompanied by a parallel jetty constructed from Bolivar Point. Because of its novelty and the large expenditure involved, his proposal was referred to a board of engineer officers.³⁵

The novelty in Howell's scheme lay in the proposed method of construction. At that time, there were no known stone quarries in Texas and the cost of transporting this material from the North would have been prohibitive. Seeking a more economical device, Howell advocated the use of gabions (cylindrical, cage-like structures of woven wicker), to be covered inside and out with hydraulic cement and filled with sand by a dredge-boat alongside as they were placed into position. The plan called for the gabions to be 6 feet in diameter and 6 feet high, with two rows in each jetty, fastened together at the top by copper wire. To act as training walls for the lower ebb current, the gabion jetties were envisioned as "submerged jetties," with the tops of the gabions 5 or 6 feet below mean low tide. Howell anticipated that the gabions, so constructed, would offer a suitable substitute for stone.³⁶

Howell pointed to the commercial significance of improving Galveston Harbor, now directly linked to St. Louis by railroad, and recommended an appropriation of \$500,000 for the year ending June 30, 1875.³⁷ The board of engineers recommended a somewhat more modest appropriation of \$60,000. Although viewing with favor the plan of Howell's proposal, the board was less confident of the method of construction entailed:

If Captain Howell's plan should succeed — and it is impossible to say that it would not — it will supply the desideratum of a cheap method of construction which might be applied to many other localities where, otherwise, no attempts at improvements would be made in consequence of the necessarily heavy outlay they would involve.³⁸

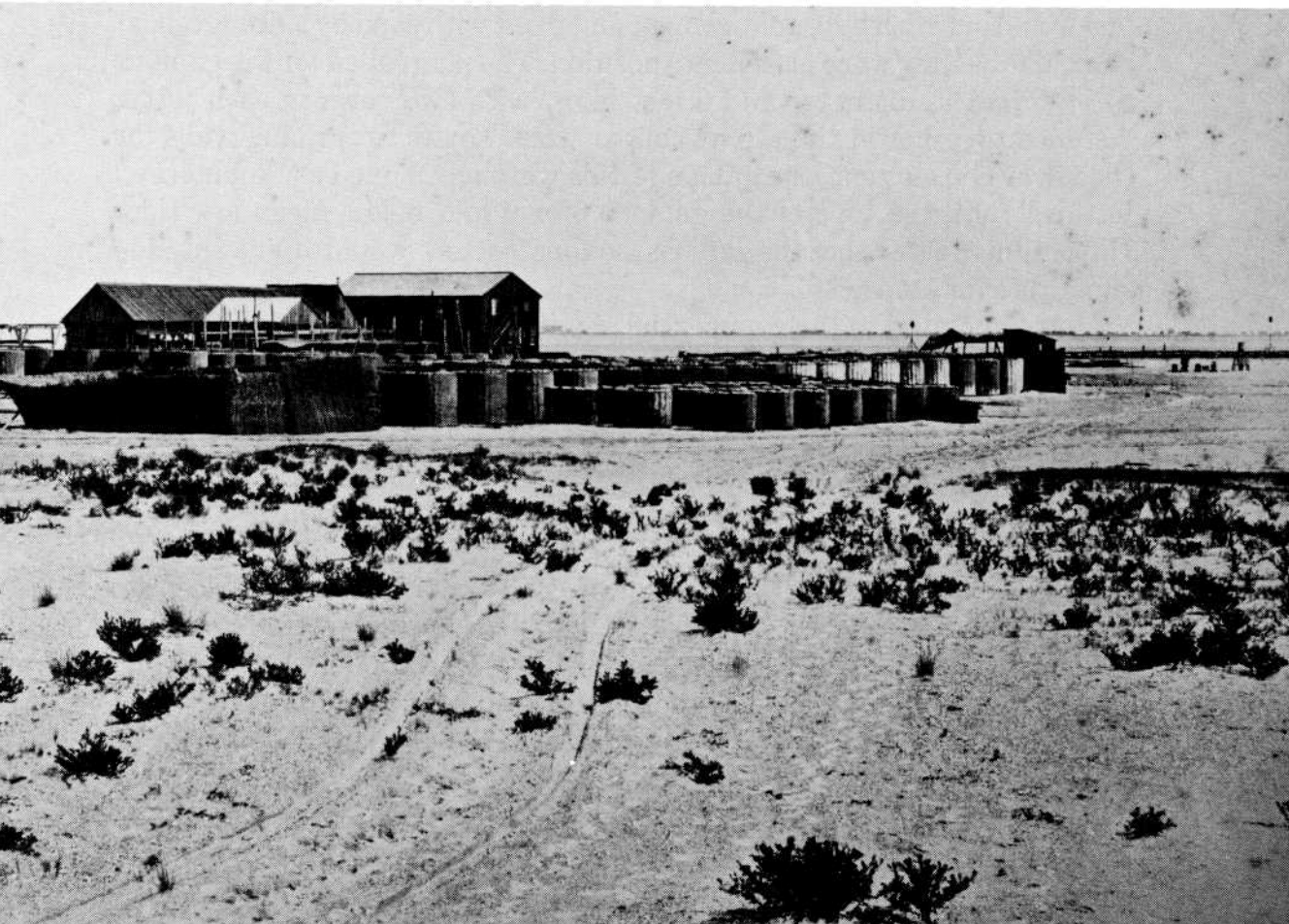
This rationale led to a trial that involved constructing an extension of the city pile breakwater on the Fort Point side and also laying a small portion of jetty from Bolivar Point near the outer bar extremity to test its efficacy in an exposed position.

Lt. (later Col.) James Baird Quinn arrived in Galveston late in August, 1874, to assume personal supervision of the experimental work. This distinctive officer would later be described by the man who had been his roommate at West Point as:

Bearded like a pard
And as mild a mannered a man
As ever scuttled a ship or
Cut a throat.³⁹

Quinn was assisted by Overseer R. M. Pease and H. C. Ripley, who served as principal assistant on surveys. Acquisition and storage of materials, construction of buildings, manufacture and placement of gabions, and purchase and construction of boats, machinery, and other necessities were Quinn's immediate concerns.⁴⁰

Grounds and buildings used for gabion construction



Innumerable delays prevented initial construction of the experimental gabions until November 1. Pease, compensated at the rate of \$125 a month, supervised his force of forty-five men. The work was divided into the fabrication and the sinking of the gabions, each phase under immediate direction of a foreman. Carpenters prepared the tops and bottoms of the gabions and rolled them outside the shed to the weaving ground, where stakes were set up and matting completed. The brush-trimmers and makers of mats and fascines (long bundles of wooden sticks bound together) improvised shelter by planting stakes in the sand, connecting the tops by strips of lumber, and covering this structure with the finished mats. Concern for working conditions of these men prompted this early statement of personnel policy:

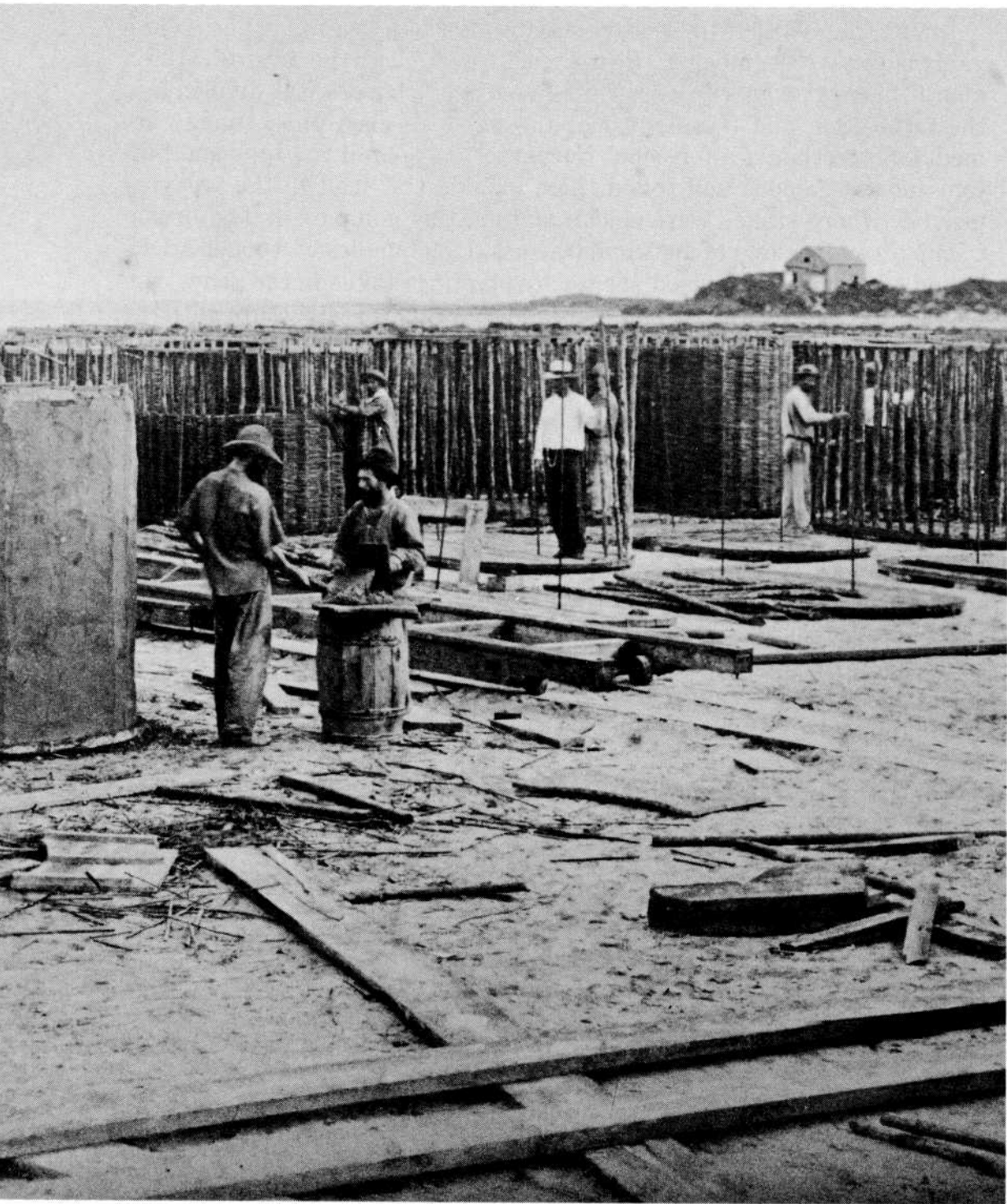
Prolonged exposure to the sun is avoided as much as possible. Strict sobriety is enforced, and remarkably good health prevails among the employés.⁴¹

The gabions were next taken to the cementing ground, completed, and placed on a launching platform to dry. Once the cement had hardened, the sinking party placed them on a schooner or flat, fastening them together in a single row on each side of the vessel. Gabions were floated against guide piles, filled with water, and sunk. A second row was sunk beside them and the gabions were filled with sand. Finally, mats were laid to prevent undermining.

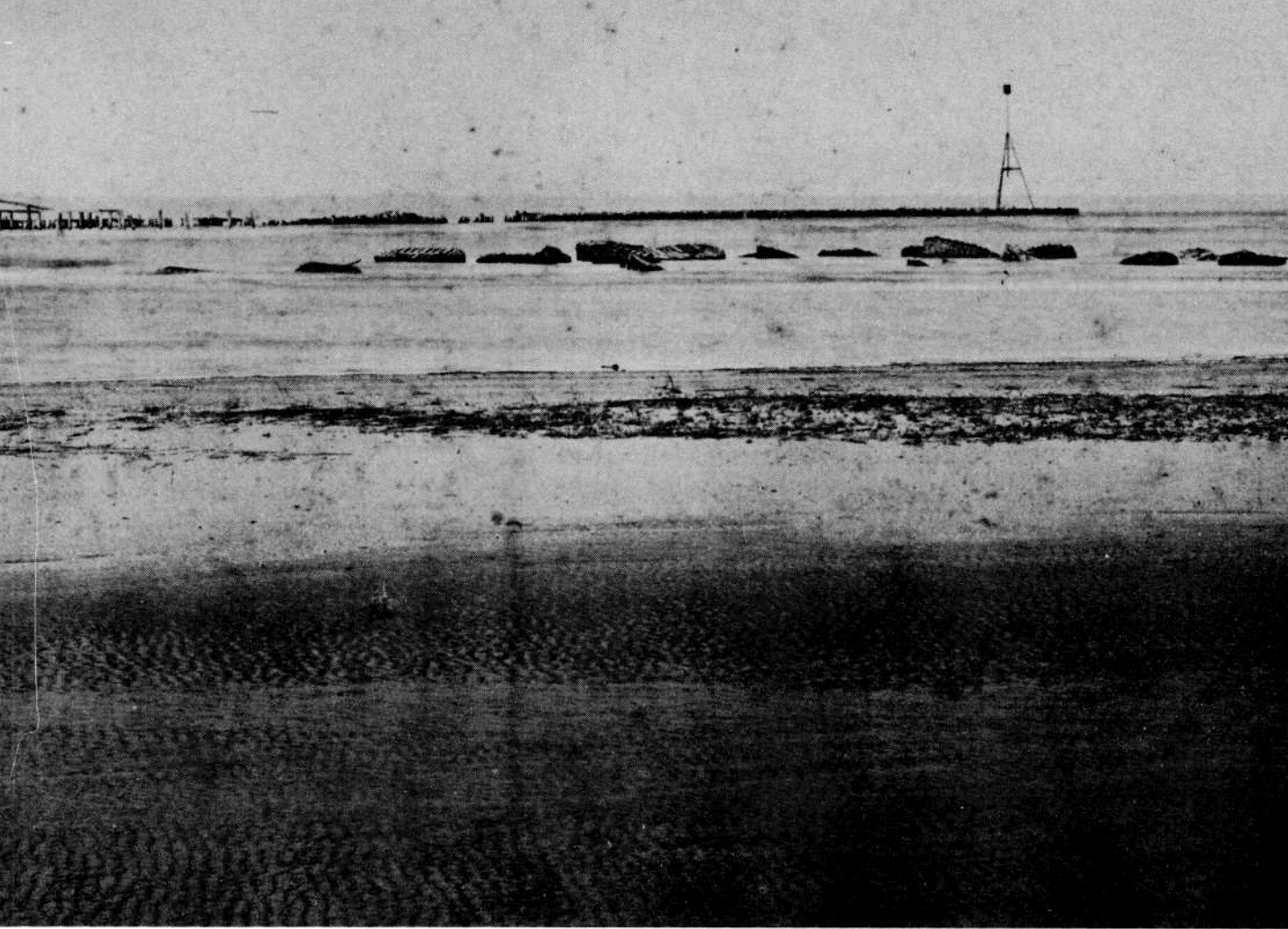
The gabion jetty construction provided a classic example of the maxim that if something can go wrong, it will. Handicapped by unavailable materials, undesirable weather, insufficient appropriations, work suspensions, and a host of other unanticipated obstacles, Howell and his men somehow managed to inch the work forward.

The elements proved a formidable adversary. Rough weather repeatedly interrupted the work and vicious storms demolished completed structures. One particularly savage storm struck the island during September 14-17, 1875. The tide rose rapidly, eventually inundating many commercial buildings on the Strand. All the buildings at Fort Point were swept away. Gradually shifting around to the northwest, the wind drove the vast accumulation of water in the bay back out to sea, significantly altering the east end of the island.⁴²

Employees at Fort Point, cut off by the storm, found themselves in considerable peril. Rescue operations were heroic. Pease, who had himself just been rescued "while drifting in the harbor," together with Assistant Engineer R. B. Talfor, other engineers, boat captains, and a volunteer lifeboat crew composed of pilots and other Galveston citizens,



Fabrication of gabions. Workmen at right set stakes in wooden bottoms as man to their left performs "basket-weaving" function. Gabion in left foreground is covered with hydraulic cement. Old fort appears in background.



Condition of construction grounds after storm of September 15, 1875

succeeded in bringing in all but two of the men left at Fort Point. The half-drowned men were brought in to the wharf, reclothed, and fed. Howell noted,

These men saved, lost nearly all their personal effects, and are deserving remuneration, the more so as they waited until cut off, working to save Government property.

Of the two men lost, "one was killed by the falling timber of the men's quarters, and the other drowned by being overweighted with clothing."⁴³ Losses in property amounted to \$50,000.⁴⁴

The board of engineers reconvened in December, 1875. Turning their attention toward the outer bar, these officers concluded that the parallel jetties as originally proposed would produce an important increase in the depth over this bar. They recommended that the first portion be constructed from Fort Point toward the main channel, and that gabions not be adopted definitively until further tested by extension of the inshore end of the Fort Point jetty and construction of a more exposed, north jetty extending from Bolivar Point.⁴⁵

In May, 1876, Lt. Charles E. L. B. Davis arrived in Galveston to relieve Quinn.⁴⁶ His first year superintending the Galveston work was punctuated by work stoppages due to lack of funds. These suspensions squandered the most propitious season for construction and resulted in dispersal of skilled laborers and deterioration of plant. Howell's disappointment and inevitable frustration were barely veiled when he stated:

I beg leave to again respectfully represent in official report that I am convinced, from such experience as I have had, that if any work of river or harbor improvement is worth undertaking it should be provided for by adequate and timely appropriation.⁴⁷

Consistent with Howell's luck, exhausted appropriations forced yet another interruption of the work from November 30, 1877 until June 15, 1878.⁴⁸

The Fort Point gabionade was completed in June, 1877. To its bitter end, this jetty was complicated by problems. Unseasonably rough weather made its usual contribution and the final work on the last few gabions was characteristic:

The last 2 gabions placed at Fort Point, in about 23 feet of water, had to be filled by shoveling sand from the deck of a barge, as the bottom was a dark blue clay, which could not be raised by the pump. The sand was shoveled into a hopper leading into the gabion filling-hole, 5 men shoveling and 1 playing an inch and a half stream of water to keep the chute from choking. It took about 3 hours to fill these 2 gabions.⁴⁹

Beneficial changes continued to accrue on the inner bar. A survey in June, 1878, revealed a widened, 20-foot least depth where there had formerly existed a narrow, intricate channel of only 12-foot depth. Encouraged by these changes, Howell commented,

The results [over the inner bar] . . . may even lead one less sanguine than myself to confidently look for results on the outer bar equally as gratifying . . .⁵⁰

Work on the Bolivar jetty to improve the outer bar began in mid-April, 1877. Beginning at the shore, a double row of pine piling, capped and braced, with sheetpiling on the seaward side was continued out 513 feet where the gabionade proper began in 6 feet of water. Because of the

muddy bottom, the gabions were filled by barrows from the shore, run out on a plank laid over the piling of the breakwater and the guide piles of the gabions. On September 17, 1877, the entire pile structure was swept away by a severe storm. Work on the Bolivar gabionade was resumed in June, 1878. By 1879, this structure appeared to have produced no important results and it was presumed that the gabionade had not yet been extended far enough into the sea to effect changes on the outer bar.⁵¹

Some 6½ years and \$477,000 later, the board of engineers reviewed the matter of Howell's proposed improvement. In its report of August 9, 1879, one succinct sentence summarized the success of the scheme: "There is no very cheap way of building jetties into the ocean."⁵² The board alluded to the "magnitude" of constructing 7 miles of piers into the open waters of the Gulf as "an undertaking of its kind unprecedented in this country."⁵³ The only comparable harbor conditions they could cite were those at the mouth of the Maas in Holland. The Dutch had utilized alternate layers of mattress and stone, protected on the slopes and top above water by large stone blocks. The board expressed confidence that this system would be as successful at Galveston as it had been in the Maas improvement. In conclusion, the board recommended that no more gabions be manufactured, that those on hand be strengthened and used for further experiment, and that trial be made using the Maas dike as a model.⁵⁴

Overall, these diverse failures and inconclusive efforts composed the prelude to the Galveston Engineer Office. The fragmented surveys inland, the camel fiasco, the sporadic interest in the Texas coastline, and Howell's frustrating struggle with the gabion jetty — all manifested various facets of the great push toward western expansion.⁵⁵ Contributing to this series of unsuccessful ventures was the tentative nature of the government's commitment to civil improvements.

Although the uniquely trained West Point engineers looked upon development of national waterways as their professional duty, neither Congress nor the president shared this viewpoint during most of the years from 1838 until after the Civil War. Consequently, the engineers were hamstrung by a desultory, if not nonexistent, program for internal improvements. On the Texas Gulf Coast, virtually no federal activity had followed the river and harbor surveys of 1852-53.⁵⁶

The period of Reconstruction ushered in a more positive approach to federal responsibility for public works. During the 1870s, the Corps of Engineers conducted numerous examinations and surveys and began improvements along the Texas Coast, from the Rio Grande to the Sabine River, and inland, as far north as the Red River. From these beginnings grew the need for a U.S. Army Engineer Office located at Galveston.

Notes to Chapter 1

¹ This account of the early organizational development of the Corps of Engineers is based on Forest G. Hill, *Roads, Rails & Waterways: The Army Engineers and Early Transportation* (Norman: University of Oklahoma Press, 1957), pp. 22, 10, 47-49, 213, 221-22.

² Unless otherwise indicated, this history of the topographical engineers is drawn from William H. Goetzmann, *Army Exploration in the American West, 1803-1863* (New Haven: Yale University Press, 1959).

³ *Ibid.*, p. 109.

⁴ The source of the name *Llano Estacado* remains questionable. Some theories that have been advanced include: "(1) Spanish legend says stakes were driven to mark the only trail across the desert. (2) Indians claim that their ancestors drove stakes to guide an unknown Great Chief who would come from the east to deliver them from their enemies. (3) Josiah Gregg, famed historian of western commerce, says the stakes marked the course between water holes. (4) Later travelers believed the stakes had been set and adorned with buffalo skulls to mark the route of the Butterfield Overland Mail." James A. Michener, *Centennial* (New York: Random House, 1974), pp. 497-98.

⁵ Goetzmann, *Army Exploration*, p. 261.

⁶ S. Ex. Doc. 1, 33d Cong., 1st sess. (1853-54), 2: 16-23.

⁷ Hill, *Roads, Rails & Waterways*, p. 220.

⁸ Goetzmann, *Army Exploration*, p. 346; Hill, *Roads, Rails & Waterways*, p. 222.

⁹ S. Ex. Doc. 1, 33d Cong., 1st sess. (1853-54), 2: 25.

¹⁰ Goetzmann, *Army Exploration*, pp. 363-64.

¹¹ *Ibid.*, p. 364.

¹² Odie B. Faulk, *Land of Many Frontiers: A History of the American Southwest* (New York: Oxford University Press, 1968), p. 183.

¹³ Goetzmann, *Army Exploration*, pp. 431-32.

¹⁴ Albert E. Cowdrey, *The Delta Engineers* (New Orleans: U.S. Army Engineers, 1971), pp. 10-11.

¹⁵ Ch. 104, 10 Stat. 56.

¹⁶ S. Ex. Doc. 1, 33d Cong., 1st sess. (1853-54), 2: 560-66; George Washington Cullum, *Biographical Register of the Officers and Graduates of the U.S. Military Academy at West Point*, 3d ed., rev. and ext. (Boston and New York: Houghton, Mifflin and Company, 1891), 2: 252-54.

¹⁷ S. Ex. Doc. 1, 33d Cong., 1st sess. (1853-54), 2: 552-60, 566-78.

¹⁸ Cowdrey, *Delta Engineers*, pp. 11-12.

¹⁹ *Ibid.*, pp. 14, 70.

²⁰ *Ibid.*, p. 14.

²¹ *Laws of the United States Relating to the Improvement of Rivers and Harbors from August 11, 1790 to June 29, 1938*, 3 vols. (Washington, D.C.: Government Printing Office, 1940), 1: 165.

²² *Annual Report of the Chief of Engineers to the Secretary of War for the Year 1871* (Washington, D.C.: Government Printing Office, 1871), p. 519 (hereafter cited as *ARCE*, followed by date of fiscal year covered in report).

²³ H.R. Ex. Doc. 136, 43d Cong., 1st sess. (1874), p. 11.

²⁴ S. Ex. Doc. 1, 33d Cong., 1st sess. (1853-54), 2: 560.

²⁵ *ARCE*, 1868, p. 498.

²⁶ *Ibid.*, pp. 498-99.

²⁷ *Ibid.*, pp. 497-517.

²⁸ Office of the Chief of Engineers, General Order 5, 24 April 1869.

29. *ARCE*, 1871, p. 517.
30. *Ibid.*, p. 521.
31. *Ibid.*
32. H.R. Ex. Doc. 136, 43d Cong., 1st sess. (1874), p. 8.
33. *Ibid.*, p. 12.
34. *Ibid.*, pp. 11-12.
35. *Ibid.*, pp. 14, 1.
36. *ARCE*, 1880, pp. 1221-22; H.R. Ex. Doc. 136, 43d Cong., 1st sess. (1874), pp. 14, 17.
37. H.R. Ex. Doc. 136, 43d Cong., 1st sess. (1874), p. 17.
38. *Ibid.*, p. 19.
39. U.S. Military Academy Association of Graduates, *Annual Reunion*, June 1915, p. 161.
40. Details of the work conducted under Quinn during 1874-75 are contained in *ARCE*, 1875, pp. 846-68.
41. *Ibid.*, p. 860.
42. *ARCE*, 1876, p. 566.
43. *Ibid.*, pp. 580-81.
44. *Ibid.*, p. 567.
45. *Ibid.*, pp. 581-84.
46. *Ibid.*, p. 575.
47. *ARCE*, 1877, p. 447.
48. *ARCE*, 1879, p. 910.
49. *ARCE*, 1877, p. 450.
50. *ARCE*, 1878, p. 606.
51. *Ibid.*, p. 603; *ARCE*, 1879, pp. 911-12.
52. *ARCE*, 1880, p. 1271.
53. *Ibid.*, p. 1269.
54. *Ibid.*, pp. 1270-71.
55. Despite his failures, Howell initiated many of the significant accomplishments of the Galveston District. This interesting young officer, who had graduated seventh in his West Point class of 1863, struggled against enormous odds and exhibited remarkable vision in approaching various projects on the Gulf Coast. He died prematurely, at the age of forty, on 5 April 1882. George Washington Cullum, *Biographical Register of the Officers and Graduates of the U.S. Military Academy at West Point*, 3d ed., rev. and ext. (Boston and New York: Houghton, Mifflin and Company, 1891), 3: 1-2.
56. Hill, *Roads, Rails & Waterways*, pp. 194-98.